

FIREFIGHTER II MOD C

Fire Detection, Alarm and Suppression Systems

Firefighter II, Mod C
Fire Detection, Alarm and Suppression Systems

- 2-18 FIRE DETECTION, ALARM AND SUPPRESSION SYSTEMS (3-3.13)**
- 2-18.1** Identify the types of fire alarm systems and their components.
 - 2-18.2** Identify the value of automatic sprinklers in providing safety to the occupants of a structure.
 - 2-18.3** Identify a fire department sprinkler connection and water flow alarm.
 - 2-18.4** Identify the main control valve on an automatic sprinkler system and determine if it is open or closed.
 - 2-18.5** Identify how the automatic sprinkler head activates and releases water.
 - 2-18.6** Identify the components of a hood and duct system and its use.
 - 2-18.7** Identify wet pipe and dry pipe systems and their uses.
 - 2-18.8** Identify the procedures to connect hose-line(s) to a fire department connection of a sprinkler or standpipe system.
 - 2-18.9** Identify the procedure of stopping the flow of water from a sprinkler head using a wedge or stopper.
 - 2-18.10** Identify the procedure of operating a main control valve on an automatic sprinkler system from “open” to “closed” and then back to “open”.
 - 2-18.11** Identify the procedures of opening and closing the main drain valve on an automatic sprinkler system.
 - 2-18.12** Identify the procedures of reading and recording the indicated pressures on all gauges provided on a standard wet pipe sprinkler system, and identify each gauge.
 - 2-18.13** Identify the procedures of reading and recording the indicated pressures on all gauges provided on a standard dry pipe automatic sprinkler system and identify each gauge.
 - 2-18.14** **Demonstrate connecting hose line(s) to a fire department connection of a sprinkler or standpipe system.**
 - 2-18.15** **Demonstrate stopping the flow of water from a sprinkler head using a wedge or stopper.**
 - 2-18.16** **Demonstrate operating a main control valve on an automatic sprinkler system from “open” to “closed” and then back to “open”.**
 - 2-18.17** **Demonstrate opening and closing the main drain valve on an automatic sprinkler system.**
 - 2-18.18** **Demonstrate reading and recording the indicated pressures on all gauges provided on a standard wet pipe sprinkler system and identify each gauge.**
 - 2-18.19** **Demonstrate reading and recording the indicated pressures on all gauges provided on a standard dry pipe automatic sprinkler system and identify each gauge.**

References

IFSTA, Essentials, 4th ed., Chapter 15
Delmar, Firefighter's Handbook, copyright 2000, Chapter 12

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Jones & Bartlett, Fundamentals of Firefighting Skills, 1st ed., Chapters 18 & 36

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2-18 Fire Detection, Alarm and Suppression Systems (3-3.13)

- I. Identify the types of fire alarm systems and their components. **2-18.1**
 - A. Fire alarm systems
 1. Protected Premises Fire Alarm Systems (Local System)
 - a. Most basic
 - b. Designed to only be initiated manually
 2. Automatic Alarm Systems
 - a. Transmits a signal to an off-site location to summon the fire department
 - b. Produces an automatic response upon activation of local alarm
 - c. Signals thorough dedicated wire pairs, leased telephone lines, fiber-optic cable, or wireless communication links
 - d. Transmission of alarm to fire department may be accomplished by the following means:
 - 1) Auxiliary system
 - a) Transmitted immediately and directly to the fire department
 - b) Uses municipally owned/controlled circuitry
 - 2) Remote station system
 - a) Connected to fire department directly or through an answering system
 - b) Transmitted by leased telephone lines or radio signal on a dedicated frequency
 - c) Must have the ability to transmit a trouble signal to fire alarm center, if system is impaired
 - d) May be monitored by an e3ntity other than the fire department

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- 3) Proprietary system
 - a) Used to protect large commercial or industrial buildings or multiple buildings at a single location
 - b) Each building or area has own alarm system wired to a single receiving point located within the complex
 - c) Receiving point must be in separate, non-hazardous area
 - d) Must be constantly staffed by trained personnel
 - e) Monitoring personnel must be able to summon fire department through alarm system or by phone
 - 4) Central station system
 - a) Similar to proprietary system but monitored off-site contracted service point called a central station
 - b) Upon alarm initiation, central station employee obtains information and notifies appropriate emergency response agency
 - c) Usually includes notifying fire department and property representative
 - d) Usually connected by supervised telephone lines
3. Four basic types of automatic alarm-initiating devices
- a. Heat detectors
 - 1) Fixed temperature heat detectors
 - a) Relatively inexpensive
 - b) Least prone to false activations
 - c) Detect heat by
 - i.) Expansion of heated material
 - ii.) Melting of heating material
 - iii.) Changes in resistance of heated materials

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- 2) Rate-of-rise heat detectors
 - a) Operates on principle that room temperature will rise faster from a fire than from atmospheric temperature change
 - b) Usually designed to initiate an alarm when increase in temperature exceeds 12⁰ to 15⁰ F. per minute
 - c) Being initiated by sudden rise in temperature, regardless of initial temperature, it can initiate an alarm at temperature much lower than required by a fixed-temperature detector
 - d) Automatically resets, if not damaged

b. Smoke detectors

- 1) Can initiate an alarm much more quickly due to smoke, not heat, being generated
- 2) Two basic types
 - a) Photoelectric
 - i.) Uses a photoelectric cell with a specific light source by either beam application or refractory applications.
 - ii.) More sensitive to smoldering fires
 - iii.) Powered by battery, household current, or household current with battery back-up
 - b) Ionization
 - i.) Uses a small amount of radioactive material to ionize air molecules
 - ii.) Products of combustion interrupt electrical charge within chamber, causing alarm
 - iii.) More responsive to flaming fires
 - iv.) Powered by battery, household current, or household current with battery back-up

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- c. Flame detectors
 - 1) Three basic types:
 - a) Those that detect light in the ultraviolet wave spectrum
 - b) Those that detect light in the infrared wave spectrum
 - c) Those that detect both types of light
 - d. Fire-Gas detectors
 - 1) Measures carbon dioxide and carbon monoxide produced by fire
- II. Identify the value of automatic sprinklers in providing safety to the occupants of a structure. **2-18.2**
- A. Discharges water directly on fire
 - B. Operates while fire is small
 - C. Products of combustion are limited
 - D. Effective in preventing fire spread to upper floors
 - E. Provides a better chance of survival for occupants of upper floors
- III. Identify a fire department sprinkler connection and water flow alarm. **2-18.3**
- A. Water flow alarm
 - 1. Located outside the building usually close to the sprinkler connection.
 - 2. Indicates that water is flowing through the system.
 - 3. Operated wither hydraulically or electrically
 - B. Fire department connection
 - 1. Located outside the building
 - 2. Is usually a Siamese connection with two 2½ inch female connections with a clapper valve or one clappered large-diameter inlet
 - 3. Used to connect supply lines to the sprinkler system

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IV. Identify the main control valve on the automatic sprinkler system and determine if it is open or closed. **2-18.4**

- A. Used to cut off the water supply
- B. Located between source and sprinkler system
 - 1. Most often located under alarm valve or outside near the system controls
- C. Types
 - 1. Outside screw and yoke (OS &Y)
 - a. Open when the word "OPEN" is visible in window
 - 2. Post indicator
 - a. Open when the word "OPEN" is in the window
 - 3. Wall post indicator
 - a. Open when the word "OPEN" is in the window
 - 4. Post indicator valve assembly
 - a. Has a sight area that is open then the valve is open or may have an indicating paddle
 - b. Valve is a butterfly valve

V. Identify how the automatic sprinkler head activates and releases water. **2-18.5**

- A. Fusible link
 - 1. Fusible link, holding two levers together, is melted during fire
 - 2. Levers and caps are pushed out of the way by water
 - 3. Water stream strikes the deflector and is converted into a spray
- B. Glass bulb
 - 1. Small bulb is filled with liquid and air bubble is heated by fire until bulb shatters
 - 2. The cap is pushed out of the way by water
 - 3. Water stream strikes the deflector and is converted into a spray

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- C. Chemical pellet
 - 1. Pellet of solder under compression melts during fire
 - 2. Plunger moves down releasing valve cap parts
 - 3. Water stream strikes the deflector and is converted into a spray
 - D. Quick release
 - 1. Specially designed fusible link with greater surface area absorbs heat faster and responds quicker
- VI. Identify the components of a hood and duct system and its use. **2-18.6**
- A. Used for local application, meaning only portion of building, directly where the hazard exists
 - 1. Restaurant cooking areas
 - 2. Laboratory hood systems
 - 3. Paint booths
 - 4. Other hazardous areas
 - B. Uses a heat sensitive device (such as a fusible link) or manually activated switch for activation
 - C. Extinguishing agents may be:
 - 1. Fine water spray
 - 2. Dry chemical
 - 3. Wet chemical
 - 4. Carbon Dioxide (CO₂)
 - 5. Halogenated or clean agents
- VII. Identify wet pipe and dry pipe systems and their uses. **2-18.7**
- A. Wet pipe system
 - 1. Used in location where piping will not be subjected to temperatures below 40⁰ F. (4⁰ C.)
 - 2. Maintains water under pressure at all times
 - 3. Connected to the public water supply so fused sprinkler can discharge a water spray in area while sounding alarm
 - 4. Both sides of control valve have pressure gauges to indicate water pressure of the supply and of the system
 - a. System side pressure should read slightly higher than supply side pressure

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B. Dry pipe system

1. Used in location where piping is subjected to temperatures below 40⁰ F. (4⁰ C.)
2. All pipes are pitched to drain system back to main drain.
3. Air under pressure replaces water in piping above the dry-pipe valve
4. When sprinkler fuses, pressurized air escapes first, and dry-pipe valve opens to allow water into piping system.
5. Quick opening devices are installed in systems with water capacity over 500 gallons to accelerate the opening of the dry-pipe valve.
6. The dry pipe valve is equipped with an air pressure gauge above the clapper and a water pressure gauge below the clapper
 - a. The air pressure gauge will read substantially lower than the water pressure gauge
 - b. If the gauges read the same, this is an indication the system has been tripped and water has entered the pipes

VIII. Identify the procedures of connecting hoseline(s) to a fire department connection of a sprinkler or standpipe system. **2-18.8**

- A. Locate fire department connection
- B. Select proper type and amount of hose
- C. Advances hose to fire department connection
- D. Removes cover from fire department connection
- E. Checks fire department connection for damage or obstructions
- F. Connects hose to fire department connection
- G. Connects hose to proper discharge outlets on pumper
- H. Notifies officer or pumper engineer that connection has been completed.

IX. Identify the procedure of stopping the flow of water from a sprinkler head using a wedge or stopper. **2-18.9**

A. Wooden wedges

1. Positions ladder close to sprinkler head
2. With someone supporting ladder, climbs to a height that the sprinkler head can be reach
3. Insert one or more wedges
4. Tap until flow of water stops or diminishes to a trickle

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- B. Commercial stopper
 - 1. Positions ladder close to sprinkler head
 - 2. With someone supporting ladder, climbs to a height that the sprinkler head can be reached.
 - 3. Insert the stopper between the orifice and the deflector
 - 4. If the operation of some type of device is necessary to open the stopper, operate it at this time until the flow stops or diminishes to a trickle.

- X. Identify the procedure of operating the main control valve on an automatic sprinkler system from "OPEN" to "CLOSE" and then back to "OPEN". **2-18.10**
 - A. Outside screw and yoke (OS & Y) valve
 - 1. Unlock any means to secure the valve in the open position and remove it
 - 2. Grasp the wheel and slowly turn it until the yoke completely disappears.
 - 3. When instructed to do so, turn the wheel slowly until the yoke is extended as far as possible
 - 4. Secure the valve in the "OPEN" position

 - B. Post Indicator Valve (PIV)
 - 1. Unlock any means used to secure the valve in the open position and remove it
 - 2. Remove the handle and place it on the operating nut
 - 3. Slowly rotate the operating nut until the word "CLOSED" can be seen in the window
 - 4. When instructed to do so, rotate the operating nut slowly until the word "OPEN" can be seen in the window
 - 5. Secure the valve in the open position

- XI. Identify the procedures of opening and closing the main drain valve on an automatic sprinkler system. **2-18.11**
 - A. If main valve is an OS&Y valve:
 - 1. To open: Turn handle slowly until stem is fully extended
 - 2. To close: Turn handle until stem is no longer visible

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- B. Other types of valves (globe, butterfly, etc.):
1. Turn handle slowly to fully “OPEN” position
 2. Turn handle slowly to fully “CLOSED” position
- XII. Identify the procedures of reading and recording the indicated pressures on all gauges provided on a standard wet pipe automatic sprinkler system and identify each gauge. **2-18.12**
- Note: Perform this evolution according to the type of system being used in the exercise.*
- A. Read and record water pressure on supply side
 - B. Read and record water pressure on system side
- XIII. Identify the procedures of reading and recording the indicated pressures on all gauges provided on a standard dry pipe automatic sprinkler system and identify each gauge. **2-18.13**
- Note: Perform this evolution according to the type of system being used in the exercise.*
- A. Read and record water pressure below dry-pipe valve clapper
 - B. Read and record air pressure above dry-pipe valve clapper
- XIV. **Demonstrate connecting hoseline(s) to a fire department connection of a sprinkler or standpipe system. 2-18.14**
- A. Locates fire department connection
 - B. Selects proper type and amount of hose
 - C. Advances hose to fire department connection
 - D. Removes cover from fire department connection
 - E. Checks fire department connection for damage or obstructions
 - F. Connects hose to fire department connection
 - G. Connects hose to proper discharge outlets on pumper
 - H. Notifies officer or pumper engineer that connection has been completed.

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XV. Demonstrate stopping the flow of water from a sprinkler head using a wedge or stopper. 2-18.15

- A. Wooden wedges
 - 1. Positions ladder close to sprinkler head
 - 2. With someone supporting ladder, climbs to a height that the sprinkler head can be reach
 - 3. Inserts one or more wedges
 - 4. Taps until flow of water stops or diminishes to a trickle
- B. Commercial stopper
 - 1. Positions ladder close to sprinkler head
 - 2. With someone supporting ladder, climbs to a height that the sprinkler head can be reached.
 - 3. Inserts the stopper between the orifice and the deflector
 - 4. If the operation of some type of device is necessary to open the stopper, operates it at this time until the flow stops or diminishes to a trickle.

XVI. Demonstrate operating the main control valve on an automatic sprinkler system from "OPEN" to "CLOSE" and then back to "OPEN". 2-18.16

- A. Outside screw and yoke (OS & Y) valve
 - 1. Unlocks any means to secure the valve in the "OPEN" position and removes it
 - 2. Grasps the wheel and slowly turns it until the yoke completely disappears.
 - 3. When instructed to do so, turns the wheel slowly until the yoke is extended as far as possible
 - 4. Secures the valve in the "OPEN" position
- B. Post Indicator Valve (PIV)
 - 1. Unlocks any means used to secure the valve in the "OPEN" position and removes it
 - 2. Removes the handle and places it on the operating nut
 - 3. Slowly rotates the operating nut until the word "CLOSED" can be seen in the window
 - 4. When instructed to do so, rotates the operating nut slowly until the word "OPEN" can be seen in the window
 - 5. Secures the valve in the "OPEN" position

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XVII. Demonstrate opening and closing the main drain valve on an automatic sprinkler system. 2-18.17

- A. If main valve is an OS&Y valve:
 - 1. To open: Turns handle slowly until stem is fully extended
 - 2. To close: Turns handle until stem is no longer visible
- B. Other types of valves (globe, butterfly, etc.)
 - 1. Turns handle slowly to fully “OPEN” position
 - 2. Turns handle slowly to fully “CLOSED” position

XVIII. Demonstrate reading and recording the indicated pressures on all gauges provided on a standard wet pipe automatic sprinkler system and identify each gauge. 2-18.18

Note: Perform this evolution according to the type of system being used in the exercise.

- A. Reads and records water pressure on supply side
- B. Reads and records water pressure on system side

XIX. Demonstrate reading and recording the indicated pressures on all gauges provided on a standard dry pipe automatic sprinkler system and identify each gauge. 2-18.19

Note: Perform this evolution according to the type of system being used in the exercise.

- A. Reads and records water pressure below dry-pipe valve clapper
- B. Reads and records water pressure above dry-pipe valve clapper